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10/786,412	02/24/2004	Roger Christiansen	8021-A-1	4995

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EXAMINER
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FICK, ANTHONY D

ART UNIT	PAPER NUMBER
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1753

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/786,412

Applicant(s)

CHRISTIANSEN, ROGER

Examiner

Anthony Fick

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 2/24/04.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities: in paragraph 0032 after equations 1 and 2,  $E_{TC}$  is referred to as the differential temperature across thermocouple TC instead of  $T_{TC}$ . Also in paragraphs 0061, 0062, 0069, 0070 and 0072, the second surface is given the reference number "36". This reference number is not within any of the figures.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 through 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Du et al. (U.S. 6,300,554) in view of Thery et al. (U.S. 4,717,786).

Du discloses a thermopile as shown in figures 2A and 2B.

Regarding claim 1, figure 2A shows a substrate having a first and second surface and having a first thermal portion and a second thermal portion, 22, a plurality of first traces, 35, extending between the first thermal portion and the second thermal portion (see figure 2B for plurality), a plurality of second traces, 36, extending between the first thermal portion and the second thermal portion. Figure 2B further shows a plurality of first junctions coupling the first and second traces in the first region, junctions H, and a

plurality of second junctions coupling the first and second traces in the second region in series with the first junction, junctions C.

Regarding claims 2, 3 and 4, Du discloses maintaining the junctions at substantially the same temperatures by surrounding the portions by mediums at different temperatures (column 12).

Regarding claim 5, figure 2A shows a plurality of third traces that pass through the substrate, 43, and couples the first trace with the second trace to form one of the first and second junctions.

The differences between Du and the claims are the requirements for metal traces, specific metals and specific junctions.

They teaches a thermocouple array made with constantan or P doped silicon coupled with copper, iron, zinc, bismuth telluride or lead sulfide (column 4, paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the constantan and copper of They as the traces of Du because They teaches the materials are functional equivalents to the materials utilized by Du, specifically P doped silicon. Because They and Du are concerned with thermocouple arrays, one would have a reasonable expectation of success from the combination. Thus the combination meets the claims.

4. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Du in view of They as applied to claims 1 through 7 above, and further in view of Onoue (U.S.P.G.Pub 2003/0121540).

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The disclosure of Du in view of Thery is as stated above for claims 1 through 7.

The difference between Du in view of Thery and claims 8 and 9 are the requirements of a specific interconnect structure.

Onoue teaches a thermoelectric module with interconnecting pins as shown in figures 6 and 8.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the interconnecting pins of Onoue within the device of Du in view of Thery because the pins reliably ensure electrical connection between the conduction layers formed on surfaces of an insulating substrate (Onoue abstract). Because Du in view of Thery and Onoue are concerned with electrically interconnecting thermoelectric layers on opposite sides of an insulating material, one would have a reasonable expectation of success from the combination. Thus the combination meets the claims.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Du in view of Thery, further in view of Onoue as applied to claims 8 and 9 above, and even further in view of Yamada et al. (U.S. 5,254,178).

The disclosure of Du in view of Thery, further in view of Onoue is as stated above for claims 8 and 9.

The difference between Du in view of Thery, further in view of Onoue and claim 10 is the requirement of the conductive pins extending into the surroundings.

Yamada discloses a thermoelectric module as shown in figure 1 with conductive pins that connect the p and n elements and extend into the surrounding medium.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the extending junctions of Yamada within the device of Du in view of Thery, further in view of Onoue because the extended junctions provide for better heat exchange with the surrounding materials to the junctions, thus improving the efficiency of the device. Because Du in view of Thery, further in view of Onoue and Yamada are concerned with thermoelectric elements, one would have a reasonable expectation of success from the combination. Thus the combination meets the claim.

6. Claims 11 through 16 and 18 through 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Du et al. (U.S. 6,300,554) in view of Thery et al. (U.S. 4,717,786), and further in view of Ladd et al. (U.S. 6,100,463).

Du discloses a thermopile as shown in figures 2A and 2B.

Regarding claims 12 and 20, figure 2A shows a substrate having a first and second surface and having a first thermal portion and a second thermal portion, 22, a plurality of first traces, 35, extending between the first thermal portion and the second thermal portion (see figure 2B for plurality), a plurality of second traces, 36, extending between the first thermal portion and the second thermal portion. Figure 2B further shows a plurality of first junctions coupling the first and second traces in the first region, junctions H, and a plurality of second junctions coupling the first and second traces in the second region in series with the first junction, junctions C.

Regarding claims 13, Du discloses maintaining the junctions at substantially the same temperatures (column 12).

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Regarding claim 15, figure 2A shows a plurality of third traces that pass through the substrate, 43, and couples the first trace with the second trace to form one of the first and second junctions.

The differences between Du and the claims are the requirements for metal traces, specific metals, specific junctions and a backplane to couple multiple thermopiles.

Thery teaches a thermocouple array made with constantan or P doped silicon coupled with copper, iron, zinc, bismuth telluride or lead sulfide (column 4, paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the constantan and copper of Thery as the traces of Du because Thery teaches the materials are functional equivalents to the materials utilized by Du, specifically P doped silicon. Because Thery and Du are concerned with thermocouple arrays, one would have a reasonable expectation of success from the combination.

Ladd teaches a thermoelectric module that interconnects a plurality of thermopiles together with a backplane to electrically connect the thermopile slices (column 3, last paragraph).

It would have been further obvious to one of ordinary skill in the art at the time the invention was made to interconnect a plurality of thermopiles as in Ladd with a backplane for a plurality of the thermopiles of Du in view of Thery because multiple thermopiles allows for a wide variety of voltages and currents to be utilized for a specific

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application, and the combination with a backplane allows for easy power distribution circuits. Also the selection of a predetermined voltage/current for a single thermocouple, a plurality of couples in a thermopile, and a plurality of thermopiles in an array are dependent on the specific application. It is well known within the art to make such a selection, and then design the thermocouple, thermopile and array of thermopiles to produce the required voltage/current for the specific application conditions. Therefore the claim requirements are obvious over Du in view of Thery and Ladd.

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Du in view of Thery, further in view of Ladd as applied to claims 11 through 16 and 18 through 20 above, and further in view of Onoue (U.S.P.G.Pub 2003/0121540).

The disclosure of Du in view of Thery, further in view of Ladd is as stated above for claims 11 through 16 and 18 through 20.

The difference between Du in view of Thery, further in view of Ladd and claim 17 is the requirement of a specific interconnect structure.

Onoue teaches a thermoelectric module with interconnecting pins as shown in figures 6 and 8.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the interconnecting pins of Onoue within the device of Du in view of Thery, further in view of Ladd because the pins reliably ensure electrical connection between the conduction layers formed on surfaces of an insulating substrate (Onoue abstract). Because Du in view of Thery, further in view of Ladd and Onoue are



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concerned with electrically interconnecting thermoelectric layers on opposite sides of an insulating material, one would have a reasonable expectation of success from the combination. Thus the combination meets the claim.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Fick whose telephone number is (571) 272-6393. The examiner can normally be reached on Monday - Friday 7 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Anthony Fick  
AU 1753  
August 20, 2007

*ADF*

  
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